

REMARKS

By way of the foregoing amendments to the claims, Claims 1-12 have been amended to delete the multiple dependencies and reference numerals, and to replace the words "characterized in that" with the word "wherein". These changes have been made in accordance with 37 C.F.R. § 1.121 as amended on November 7, 2000. Marked-up versions of Claims 1-12 indicating the changes accompany this Preliminary Amendment.

Early and favorable consideration with respect to this application is respectfully requested.

Should any questions arise in connection with this application, the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: Robert S. Swecker
Robert S. Swecker
Registration No. 19,885

P. O. Box 1404
Alexandria, Virginia 22313-1404
(703) 836-6620

Date: June 15, 2001

Attachment to Preliminary Amendment dated June 15, 2001

Marked-up Claims 1-12

1. (Amended) A fiber-optic pressure sensor [(1, 25)], in particular suitable for measuring differential pressures and flow rates in oil drill holes, comprising a transducer [(1)] with a sensor fiber [(2)] which has at least one fiber Bragg grating [(3, 4, 5)], [characterized in that] wherein

a) the transducer [(1)] comprises at least one first pressure member [(7a)] for holding a first medium [(11a)] under an all round pressure p_1 ,

b) the transducer [(1)] comprises at least one second pressure member [(7b)] for holding a second medium [(11b)] under an all round pressure p_2 , and

c) the transducer [(1)] is configured for measuring a pressure difference $p_1 - p_2$ by converting the all round pressures p_1 , p_2 into a longitudinal elongation or compression of the at least one fiber Bragg grating [(3, 4)] of the sensor fiber [(2)].

2. (Amended) The fiber optic sensor [(1, 25)] as claimed in claim 1, [characterized in that] wherein the transducer [(1)] is configured for a differential elongation of the fiber Bragg grating [(3, 4)] induced by the pressure difference $p_1 - p_2$.

3. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-2] claim 1, [characterized in that] wherein

a) the sensor fiber [(2)] is mounted between holders [(6a, 6b, 6c; 15b)] and preferably prestressed,

Attachment to Preliminary Amendment dated June 15, 2001

Marked-up Claims 1-12

b) the holders [(6a, 6b, 6c; 15b)] are connected in a force-closed fashion to the pressure members [(7a, 7b)] and, if appropriate, to supporting members [(15a)], and

c) the pressure members [(7a, 7b)] are configured to deflect at least one holder [(6a, 6b, 6c)] as a function of the pressures p_1 , p_2 .

4. (Amended) The fiber optic sensor [(1, 25)] as claimed in claim 3, [characterized in that] wherein

a) exactly two cylindrical pressure members [(7a, 7b)] are provided, which are arranged concentrically, in parallel or serially relative to one another,

b) the pressure cylinders [(7a, 7b)] have the same length L and

c) the holders [(6a, 6b, 6c)] are fastened on plunger faces [(8, 8a, 8b)] of the pressure cylinders [(7a, 7b)].

5. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-4] claim 1, [characterized in that] wherein

a) the transducer [(1)] has separate inlets [(10a, 10b)] for the media [(11a, 11b)] into the pressure members [(7a, 7b)] and/or

b) a fiber Bragg grating [(3)] is provided for differential pressure measurement, a fiber Bragg grating [(4)] is provided for error compensation, and/or a fiber Bragg grating [(5)] is provided for temperature measurement.

Attachment to Preliminary Amendment dated June 15, 2001

Marked-up Claims 1-12

6. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-5] claim
1, [characterized in that] wherein

a) a fiber Bragg grating [(3)] is held [(6a, 6b)] between the first and second pressure
members [(7a, 7b)] for the purpose of differential pressure measurement, and

b) in particular, an error compensation fiber Bragg grating [(4)] is held [(6a, 6c)]
between the second and first pressure members [(7b, 7a)] in reverse sequence for the purpose
of antiphase change in elongation.

7. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-6] claim
1, [characterized in that] wherein

a) a fiber Bragg grating [(3)] is held [(6a, 15b)] between a holder [(6a)], which can
be deflected by differential pressure of two pressure members [(7a, 7b)], and a supporting
member [(15a)], the holder [(6a)] preferably being connected to a common end plate [(8)] of
two serially arranged pressure members [(7a, 7b)] and

b) in particular, an error compensation fiber Bragg grating [(4)] is held [(6a, 15b)]
between the supporting member [(15a)] and the holder [(6a)] which can be deflected by
differential pressure in reverse sequence for the purpose of antiphase change in elongation.

8. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-7] claim
1, [characterized in that] wherein

00000000-00000000

Attachment to Preliminary Amendment dated June 15, 2001

Marked-up Claims 1-12

a) one fiber Bragg grating [(3)] each is held [(6a, 15b)] between a first pressure member [(7a)] and a supporting member [(15a)] and a second pressure member [(7a)] and a supporting member [(15a)], and

b) a pressure difference can be determined with the aid of the two fiber Bragg gratings [(3, 4)].

9. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-8] claim
1, [characterized in that] wherein

a) at least one pressure member [(7a, 7b)] and/or at least one supporting member [(15a)] consists of, or is assembled from materials with different coefficients of thermal expansion a_1 , a_2 , such that a differential thermal expansion between the holders [(6a, 6b, 6c)] counteracts a thermally induced displacement of a Bragg wavelength [(1_b)] of the sensor fiber [(2)], and

b) in particular, a pressure or supporting member [(7a, 7b, 15a)] is assembled from at least two segments with different coefficients of thermal expansion and prescribable lengths L' , L'' .

10. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-9] claim
1, [characterized in that] wherein

Attachment to Preliminary Amendment dated June 15, 2001

Marked-up Claims 1-12

a) the transducer [(1)] has pressure-tight fiber bushings [(12a, 12b)] for the sensor fiber [(2)], and/or

b) the transducer [(1)] has a cavity [(13)] for a fiber Bragg grating [(5)] for the purpose of temperature measurement, and/or

c) at least one block with a bore for laterally supporting the sensor fiber [(2)] is provided in the region of a fiber Bragg grating [(3, 4)] for the purpose of a compression arrangement.

11. (Amended) The fiber optic sensor [(1, 25)] as claimed in [one of claims 1-10] claim 1, [characterized in that] wherein a plurality of transducers [(1)] of different Bragg wavelength λ_b are optically connected to a broadband light source [(16)] and, preferably via a fiber coupler [(18)] to a wavelength-division demultiplexer [(19)] and a detector plus an electronic measuring system [(20)].

12. (Amended) Use of a fiber optic differential pressure sensor [(1, 25)] as claimed in [one of claims 1-11] claim 1, [characterized in that] wherein

a) a flow rate v_1 of a fluid flow [(24)] is determined from a differential pressure measurement, and

b) in particular, the differential pressure measurement is carried out at a venturi tube [(23)].